KAS

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C O N F I D E N T I A L

April 14, 1965 96036808

Mr. J. A. Kelley — Home Office

O. F. Stewart — Travelers Rest

Report on Trip to Libby - March, 1965

Dear Mr. Kelley:

I was at Libby from March 22nd to April 2nd, 1965. Listed below is a summary of the items we reviewed along with comments of my own.

Butch and I spent all day Monday, March 22nd, working up the specifications for #4 for Kaiser Gypsum Company. We also worked out a testing method which can be applied to all ore sizes. You received copies of all this correspondance. Since I have not heard otherwise from you, I assume the testing method was alright and I will have this duplicated and give copies to Andy and Lewis Hash.

On Tuesday I visited the mill and talked informally with Bleich and Melcher on pilot plant.

Most all of Wednesday was spent with Butch and Ray Kujawa in discussions with the Maryland Casualty Insurance Company representatives, Mr. Schmidt from their regional office at San Francisco and Mr. Walker, the local representative from Spokane.

EXHIBIT 79

They took 3 dust samples from the dry mill with Libby's sampler to send to a lab in Spokane for dust count. Also Mr. Schmidt took a sample of dryer discharge for analysis of some type. Mr. Schmidt also went over the proposed safety plan that Frank Rupp sent out several months ago asking for comments. Libby was doing most of this already in their own plan. He asked if we had a similar safety program at South Carolina. I had to tell him we didn't have a formal plan such as safety committies, etc. I did tell him about the 3 year record at the mine and one year at the mill. I'm sure Ray or Butch will review this in more detail and that someone in Chicago will get a copy of Mr. Schmidt's report. Actually he didn't have many recommendations that Libby wasn't already doing. He did recommend that we stop allowing men to ride the skip hoist and doesn't like the manlift.

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While I am on the subject of dust I might as well discuss this. In general the dry mill looked better than I have seen before. There were still a few points that dust was escaping. These were mostly the type that R&M can fix, like holes in chutes and broken rubber around a couple of feed spouts to the screens.

As Butch stated in his report on this, they have a dust sampler and the readings are taken once a month. Bud Vinion handles this and I went through the process to learn how it was done. I want to get set up here so we can do the same thing at Kearney and the plants.

Listed below is a summary of the dust count in the dry mill by both the Montana State Board and by Zonolite (Z). Readings are in millions of particles per cu. ft. of air.

Floor	1956	1959	1962	1963	April 1964	Sept. 1964	1965 (Z)	1965 (Z) 1-14	1965 (Z) 2-18
6	N.D.	46.3	51.0	30.6	N.D.	11.0	9.2	4.0	6.6
5	17.9	51.8	69.5	65.6	37.6	N.D.	N.D.	4.7	7.2
4	51.8	26.2	90.0	32.4	20.6	9.7	8.0	5.6	8.5
3	28.7	24.8	60.5	32.8	22.0	N.D.	N.D.	2.5	7.2
2	48.3	27.2	59.2	50.0	59.2	43.3	52	3.8	11.5
Half Deck	N.D.	N.D.	54.5	77.8	54.4	48.3	38.6	10.0	15.9
1	83.0	7.5	44.8 & 50.9	59.8 & 26.8	N.D.	N.D.	N.D.	3.2	6.8

The September, 1964 samples by Zonolite were taken by Bud Vinion at the same time and same way as the Montana State's so that they could see if they obtained similar results. The count was close. The 1965 samples showed that we were under the 20 mppcf limit.

Mr. Wake, the Engineer for the Montana State Board, has been checking Libby for some time. At first he stated the maximum allowable should be 50 mppcf, he then reduced it later to 20 mppcf. Now that they have gotten it below this level, he is talking about a 5 mppcf limit that is set for asbestos. I doubt that Libby will be able to get below the 5 level with the present dust collection system. To get below and stay there, I think it would require a completely rebuilt system.

Butch thinks you could get a 5 count in downtown Libby on many dry days. I told him to have Bud check it some time as well as the expander area. Mr. Wake has never said anything about the expander area.

Dust masks were being worn by personnel working in the dry mill.

As for Mr. Wake's recommendations I believe they have or in the process of completing them. The cyclones for the big fan are made and they plan to have these installed and connected within the next month or 6 weeks. However, they had not planned on putting a vertical stack on the fan. Butch stated that he had rather put a 50' horizontal stack out toward the vacant area rather than the vertical stack. This can be decided after installing the cyclones and determine their efficiency.

On thing I did not do was to come up with a plan for eliminating the dry mill concentrating circuit. Right now all I know to do is to either rod mill or roll crush the jig concentrate in the wet mill. Actually I don't think this is going to make a lot of difference since we will have to screen the products dry anyway. We will still have the same dust problem but less equipment to control. We still have the balance problem to contend with. I know this needs attention but we need some drill results and pilot plant information before going off on the deep end with this.

Prospecting:

In general the drill results and evaluation on the East end on "C" level, Knoll 2, proved to be accurate enough to be used for future planning. I didn't write down a lot of comparison figures between computed and actual, but they were fairly accurate. I have asked Don Riggleman to write this up in summary form outlining the accuracy and comparisons. Of course, drilling on 100 ft. grids will not pin point ores, grades, etc., but it will outline ore areas, waste areas and give a fairly accurate grade and size ratio for an area. Blast hole drilling pin points for mining purposes much more accurately than prospecting holes.

The main point here is that we can use the drill computor results with some confidence. Don's report will bear this out.

Drilling at Libby is somewhat expensive. Butch estimates that it is costing them $1.15 a foot for prospect drilling plus the depreciation on the drill. 67¢ for drilling and 48¢ per foot for assaying and computor work.

Lou states that he can not keep up with blast hole drilling and do the prospect drilling also, therefore, it will be necessary to contract the prospect drilling this summer. Using an estimate of $1.00 per square foot for contract drilling will bring the total cost to approximately $1.50 per foot. Since we have $50,000 approved for 1965, this means we can get approximately 33,500 ft. of holes.

It may vary between 33 and 40,000 ft., depending upon the final contract price.

The question then arose as to how to get the maximum information from this footage. They had planned on 180 ft. holes. However, after a discussion everyone (Riggleman, Krupp, Bleich and myself) agreed that for the present we need more coverage rather than depth. We, therefore, agreed to limit the holes to approximately 100 ft. in depth and drill the following areas in order listed below:

1. South central edge - This is a ridge or relatively gentle sloping neck that protrudes from the main body between the mine waste dump and the 2nd Knoll. There are reasons to believe that coarse grade feed may extend out in this area.

2. Drill 2 lines (developing into 4 lines going toward the east) just north of and parallel to the north haul road from the first curve to the 2nd Knoll. A few holes already drilled along the curve shows some fairly useable mill feed.

3. Southern edge of the 2nd Knoll on levels 2 and 3. This is an extension of the previous 2nd Knoll drilling.

Because it will take twice as long or more to assay and compute the drill hole results than it will to drill, all the drilling should be done in at least a 4 month period starting as soon as possible. The period of May through August should be set up as a Target. Also I suggested to Butch that he consider a smaller drill than the one at Libby. It isn't necessary to have such a large hole for prospecting. A 4" drill should give as good results and should be cheaper. The availability is another item. They had already received some proposals from contractors and awaiting others.

Hooper is going to send Butch the information on his drilling of biotite, the cost and type drill. This will be a guide to help him with his contractors.

The complete assaying and computor work should all be finished by December, 1965 and no later than February, 1966 so that we will have the benefit of this information for planning the 1966 drilling program.

As for the assaying they have stopped making a complete screen analysis and are making a -3+10, -10+28, -28+65 and -65 split. Attached is a lab sheet showing the information recorded on the drill sample. The reasons for changing to the above split was mainly one of economics, shorten assay time, computor uses these fractions. No samples of less than 15% vermiculite are run other than to determine the vermiculite percentage. Parts of all samples are being retained. Also attached is a copy of a sheet prepared by the computor on a drill hole. Only weights are recorded on the lab sheet, the computor does the calculations.

They are starting to use the blast hole information for quality control. However, this has not advanced very far and Lou stated that he had a lot of work to do here in order to make the best use of the information available. I see no reason for holding up on this and I suggest immediate use of this by Thorn and his men. However, the drilling must get out ahead of mining before this will mean much. Many times they are mining before the assay work is finished on the blast holes.

Drilling blast holes in the west end is much more difficult and slower than the east end. Most of the drilling now and the immediate future will be in this area thus tieing up the drill more.

Mining:

According to Luther his main problem is still one of hunting for coarse ore feed. There is only 4-6 monthly supply of #1 and #2 bin feed opened up and ahead of him now.

They plan to open up the 14th level this spring and summer. The first two prospect drill areas are based on hunting for #1 and #2 bin feed (coarse ore). The high grade (#3 and #4 bin feed) is very limited and is on a day to day basis. It is also not very uniform. The 14th level should open up from 100,000 to 150,000 tons of feed. It will be coarse 5 bin feed first and then 1 and 2 bin type.

They plan to start 4 shovel shifts now and will run this until at least November 1st. This is necessary for opening up the 14th and trying to get some ore into stockpile.

Luther estimates that he will have a 1:2.2 ore waste ratio with a 32-33% feed for the rest of 1965. This is not much of a change from 63 and 64. Also he stated that a change from 200 TPD of #1

and #2 to 140 tons would help him considerably. He must become less dependent on the high grade biotite zone. This is another reason for choosing the prospecting areas 1 and 2 above.

To affect the above change in #1 and #2 ratios would require approximately the following:

	NOW		SHOULD BE	
#1	100 TPD)	40%	70)	27%
#2	100)		70)	
#3	160		190	
#4	150		180	
Total	510		510	

To accomplish the above the mill must first demonstrate the ability to produce the increase tonnage of #3 and #4 and then we should change the ratio of 1 and 2 to about 25%.

Luther estimated it would cost approximately 15¢ a ton more on mill feed to stockpile and double handle it. I doubt that it will be this much but even if it is, we have to give it a good try. I suggested that he start by stockpiling and blending ores for each feed bin type. The 1 and 2 hold coarse low grade, the 5 bin fine low grade, the 3 bin high grade biotite and the 4 bin coarse high grade vermiculite. I doubt if he will be able to do any stockpiling of 3 and 4 bins to any extent. He should first concentrate on 5 bin and 1 and 2 type bin. They "bought" my idea on this.

Luther first stated that it would be months before he could start the stockpiling. However, Butch later stated that he thought he could move this up to the middle of May. This is a <u>must</u> to try out and get additional information on. I'm sure the mill can offset any additional mine cost and at the same time get out more daily production. I suggested for a started blending in stockpile the low grade from level one on Knoll 2 with the better grade feed from Knoll 3. They are going to mine additional tonnage from Knoll 3 the same way as last summer.

<u>Mill Operation</u>:

During the past year there appears to have been some slight improvement in the wet mill performance. Listed below are comparisons of

1963 and 1964:

	1963	1964	(Dec) or Inc.
% Vermiculite in Mill Feed	34.7	35.1	.4
% Vermiculite in Tails	13.4	12.1	(1.3)
#3 Yield	65.4	67.3	1.9
#4 Yield	48.3	48.9	.6
+48 Mesh Rec.	58.1	64.9	6.8
Overall Rec.	48.7	51.4	2.7
% Vermiculite in #3 Conc.	84.7	86.0	1.3
% Vermiculite in #4 Conc.	81.1	78.1	(3.0)

The above were taken from the mill sheet figures. The #3 showed a 1.9 increase in yield along with a 1.3% increase in vermiculite. The #4 increased only 0.6 B/T while showing a 3% decrease in vermiculite. This doesn't appear reasonable but there was also a change in screen size. There was a slight improvement in recovery. As you know these figures are along way from the goals set up to accomplish in 1965.

There was an increase in #4 size production. This was accomplished by utilizing some of the sizer overflow and #4 size from the dust cyclones. Also some production was accounted for by using larger openings on the #4 top size screens and not screening out the undersize. In my opinion this went too far and the #4 product changed screen size to the extreme. They are now changing back to more nearly duplicate the former screen size and make a more uniform product. This will cut the #4 production from what it has been lately. Also they have been grinding the mids from the tables which reduced the #3 and increased the #4 production. Due to the push on #3 they were going to stop grinding the mids.

John Ransome told me they had been producing a #3 with 8-9% rock. This is much better than the 1964 average but this may change with the change in grinding the mids.

Almost all of their work during 1964 was directed toward making the present mill perform better and little or no research work was done in the lab and no pilot plant work.

Bill Melcher's work so far has been directed toward working with the present circuit. He made a study of the tables and thinks the main item for increase recovery and grade is a uniform feed rate. For instance in checking the feed rate to a table over 4 or 5 day period, the rate varied from .8 to 1.5 TPH with the vermiculite percent ranging from 32% to 64%. Both John and Bill think there is too much

feed tonnage and grade variation to the fines circuit. I agree.

Other items that Bill has checked include:

1. Reagent adjustments along with addition of alum. Little success here.

2. Adding some excess acidic acid to the amine. No conclusions yet as to the benefit.

3. New two stage conditioner on south section of tables appears to have reduced reagents some. Extent unknown.

4. Extended riffles on tables, about two-thirds extended. Doesn't appear to have increased capacity but makes a cleaner tails.

5. Increased table stroke from 3/4" to 15/16" on one table. Appears to make a better tail with no change in concentrate. They also have tried a 1-1/8" stroke but this tears up the table.

Starting on Monday, March 26th, the operators will check the reagent rates every 2 hours, record and hand them in.

They are going to set up and operate the pilot plant on vermiculite. Middle of May is target date for operation. The first stage will be to try and duplicate the present mill for a vermiculite float to try and determine the affects of a uniform feed and rate, how good a concentrate and tails can be made with different feeds, etc. The aim here is to see if a 95% concentrate at a 90 or 95% recovery can be obtained under controlled conditions. At the same time they are to run lab tests to find out what it takes to produce a 70 B/T #3 and a 55 B/T #4. That is what screen analysis, % rock, % biotite, etc.

The second phase of pilot plant operation will be on floating the fine rock in cells. I do not think it advisable to write up definite plans beyond this as the next step in research work depends to a great extent on what results have been accomplished.

Bill now has 1 pilot plant operator and 1 lab man assigned to him. It may be necessary to add another later.

I am convinced that the only way to check this out is in the pilot plant, work and more work every day until we get some limits, possibilities and goals for the large mill circuit. It will then

1. Libby can produce #1 and #2 in about a 1:1 ratio now as well as any other. To produce more than this ratio of #2, the #1 has to be ground. Grinding not only cost more but reduces the total +8 tonnage. They are pushed now to produce the required amount.

2. We get less money for the #2.

3. It would mean changing Zonolite plants to #1 which would cost us additional in freight.

For instance the freight from Libby to Denver, Omaha and Minneapolis is the same on #1 as #2. The #2 freight is $1.02 per ton cheaper to Milwaukee. In going through the tonnage of #2 shipped last year to our northern plants, I estimate they used the following amounts for House Fill:

Plant	Tons	Frt. Diff.	Total Cost
Chicago	500	$1.02	$510
Dearborn	500	2.92	1460
Wilder	500	2.92	1460
Ellwood City	1000	3.35	3350
St. Louis	300	2.74	822
Easthampton	0		
Weedsport	0	-	
Total	2800		$7602

If Western Mineral changes to #2 and Zonolite changes their #2 to #1, it will cost Zonolite:

$7,600	In Excess Freight
4,000	Price Difference from Western Mineral
$11,600	

Our 12 month moving totals are as follows for the end of February:

#1	#2	
27895	31861	= 59756
-1850	+1850	Adjust for Western Canada's Change
26045	33711	Ratio Now

be a job of making the large mill duplicate the pilot plant as near as possible.

Melcher is to write a summary report every two weeks or twice a month.

As I mentioned before both John and Bill are convinced now that they must have a more uniform feed to the mill to get it working better. I'll certainly buy this one. The mine can help this situation by getting ahead and blending feeds in the stockpiles. However, this is only part of the job. The mine can only do so much and the mill will have to do their part also. Some things that the mill could do to help are:

1. Grind the feed or rod mill the feed.

2. All feed to wet mill.

3. Different bottoms on raw ore bins and or a heating system on the bins.

4. A surge bin on the -8 mesh fraction from the low-head screens.

The first two depends upon the ratio of coarse to fines that we can live with. John is working up an estimate on the 4th which will be expensive and I will guess $70,000. I'm not too sure of this one yet. It will help on hour to hour surges but not on major changes. I still think the best single thing that will help the most is for the mine to get ahead and blend ores. A more uniform feed certainly should result in better recovery and concentrate and more daily production.

General:

They are still shipping all ore to Calgary in trucks. At 6000 TPY this means that we are losing at least a $1.00 per ton on this from our regular shipments. Butch will have to install a short conveyor ($1000) in order for these trucks to stop interferring with bag car loading. I only mention this as it is taking approximately $6,000 a year off the profit at Libby.

You asked about changing Western Mineral from #1 to #2 for House Fill. I don't think this is a good idea now for the following reasons:

Case 1

If we change 4000 tons from #1 to #2 at Western Mineral only, we will have the following ratio:

22045	#1	37711	#2

Case 2

If Wemco stays the same and Zonolite changes to #1 for House Fill, we will have approximately the following:

26045	#1	33711	#2
+2800		-2800	
28845		30911	

Case 3

If Wemco changes to #2 and Zonolite changes to #1:

26045	#1	33711	#2
-4000		+4000	Wemco
22045		37711	
+2800		-2800	Zonolite
24845		34911	

Case 2 would actually be a better ratio according to Butch. The best thing would probably be leave well enough alone as it is now at the 26000 and 33000 level. Zonolite should be using the #2 if anyone does because of the freight savings and also because of our D-16 projections. The southern plants will have to stay with #2.

This is a complicated situation and I suggest thorough investigation before changing anyone completely to #2. If Libby was not pushed for total #1 and #2 production, it might be a different situation and going completely to #2 would then maybe be a good step. Your comments would certainly be appreciated on this subject. Even at 200 tons per day of total production, Libby is still 5000 tons short of the 60,000 tons presently required.

200 TPD x 275 Days = 55,000 Tons

The #3 situation is also becoming critical. If Libby supplies only 50,000 tons then this means 183 TPD of production at 275 days. At the rate of 160 TPD (first 3 months), this amounts to only 44,000 tons per year at 275 days operation. Therefore, Libby must get their #3 up to 190 TPD for the rest of the year. To do this they are going to stop grinding the table mids and up the feed rate to the wet mill. Also they will get the tailings mill ready to go. At 90 TPD rate the 10,000 tons on the stockpile can be used up in approximately 100 days. To run 5,000 tons, it will require about 56 days. I would not like to see this stockpile used up this year. What would happen next year if the same trend continues? It is possible that Libby could be called on for 60,000 tons instead of 50,000 and in that case we would be in trouble unless we could substitute some more #4.

We went over the ore storage situation. Butch does not recommend that we change any of it and I agree. We do not think it advisable to take a #4 bin for #5, yet we do need a #5 bin for the Verxite #5 size, even a small one. They are also running tight on C-T #4 storage with the increased business. There is a possibility of taking the #2 and #3 out of the bins downtown and converting these to #5 and CA (Japan). It would help if we could sell Japan straight #3 instead of the CA mix (has to be bagged). The #2 and #3 could be hauled down as needed for overseas shipments. They might run into trouble on quality or grade in some instances on this.

Right now I suggest we sell the Gypsum companies #5 from Kearney only until Libby can make a better #5 (cell rock float). Otherwise they will have to make 2 types of #5 if U.S.G. will not take the coarser size. Our main problem on storage is downtown and not at the river bins.

We also worked out a set or mill control specifications for each size ore. A separate report was prepared on these, see letter to Lewis Hash.

Butch was going to have a sample of KSOV (LSOV) prepared and forwarded to Milt Parker. I still think the best bet on this is to take a coarse ore fraction and grind it up. Although some sizer overflow can be made it will not be enough tonnage. The concentrating and bagging will have to be worked out. Butch was to follow through on this right away.

I also spent one afternoon with Dave after his return from Newark going over the D-16. He thinks he has the burner working fairly good now. On one test he obtained a 75 bag yield on 80.1 estimate at 80 BPH and a 60 vac. They were getting 8% over the estimated yield on #3. This was a yield of 71.2 with a 66.4 estimated yield at 81 BPH and a 82-84 vac. The vac is high for maximum yield. On a #4 test he had 14½% yield over the estimated. This was 55.2 B/T on an estimated of 48.2, rate was 62 BPH with a 86 vac. Again the vac is too high for maximum yield. Also they were having some brick work trouble that will be corrected in the other furnaces.

I am returning your copies of my previous reports in case you will need them again.

Sincerely,

O. F. S.

OFS:ntr

cc: R. A. Bleich - Libby